FCC

SAR

TEST REPORT

ISSUED BY
Shenzhen BALUN Technology Co., Ltd.

FOR

Personal Ground Station

ISSUED TO
Yuneec Technology Co., Limited

2/F Man Shung Industrial Building, 7 Lai Yip Street, Kwun Tong, Hong Kong

Report No.:	BL-EC1810138-701
EUT Name:	Personal Ground Station
Model Name:	ST10C
Brand Name:	YUNEEC
FCC ID:	2ACS5-ST10C
Test Standard:	FCC 47 CFR Part 2.1093
	ANSI C95.1: 1999
	IEEE 1528: 2013
Maximum SAR:	Body (1 g): 1.119 W/kg
	Handheld (10 g): 0.635 W/kg
Test Conclusion:	Pass
Test Date:	Mar. 22, 2018 ~ Mar. 27, 2018
Date of Issue:	Mar. 30, 2018

Tested by: Zong Liyao
Zong Liyao
(Engineer)
Date Mar. 30, 2018

Approved by:
Liao Jianming
(Technical Director)
Date Mar. 30, 2018

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Revision History

Version	Issue Date	Revisions Content
Rev. 01	Mar. 30, 2018	Initial Issue

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1 GENERAL INFORMATION

1.1 Identification of the Testing Laboratory

Company Name	Shenzhen BALUN Technology Co.,Ltd.
Address	Block B, 1st FL, Baisha Science and Technology Park, Shahe Xi Road, Nanshan District, Shenzhen, Guangdong Province,P. R. China
Phone Number	+86 755 6685 0100
Fax Number	+86 755 6182 4271

1.2 Identification of the Responsible Testing Location

Test Location	Shenzhen BALUN Technology Co.,Ltd.
Address	Block B, 1st FL, Baisha Science and Technology Park, Shahe Xi Road, Nanshan District, Shenzhen, Guangdong Province,P. R. China
Accreditation Certificate	The laboratory has been listed by Industry Canada to perform electromagnetic emission measurements. The recognition numbers of test site are 11524A-1. The laboratory is a testing organizatin accredited by FCC as a accredited testing laboratory. The designation number is CN1196. The laboratory is a testing organization accredited by American Association for Laboratory Accreditation (A2LA) according to ISO/IEC 17025.The accreditation certificate is 4344.01. The laboratory is a testing organization accredited by China National Accreditation Service for Conformity Assessment (CNAS) according to ISO/IEC 17025. The accreditation certificate number is L6791.
Description	All measurement facilities used to collect the measurement data are located at Block B, FL 1, Baisha Science and Technology Park, Shahe Xi Road, Nanshan District, Shenzhen, Guangdong Province, P. R. China 518055

1.3 Test Environment Condition

Ambient Temperature	21 to 23℃
Ambient Relative Humidity	35 to 49%
Ambient Pressure	100 to 102KPa

1.4 Announce

(1) The test report reference to the report template version v2.2.

(2) The test report is invalid if not marked with the signatures of the persons responsible for preparing and approving the test report.

(3) The test report is invalid if there is any evidence and/or falsification.

(4) The results documented in this report apply only to the tested sample, under the conditions and modes of operation as described herein.

(5) This document may not be altered or revised in any way unless done so by BALUN and all revisions are duly noted in the revisions section.

(6) Content of the test report, in part or in full, cannot be used for publicity and/or promotional purposes without prior written approval from the laboratory.

2 PRODUCT INFORMATION

2.1 Applicant Information

Applicant	Yuneec Technology Co., Limited
Address	2/F Man Shung Industrial Building, 7 Lai Yip Street, Kwun Tong, Hong Kong

2.2 Manufacturer Information

Manufacturer	Yuneec International (China) Co., Ltd.
Address	No.388 East Zhengwei Road, Jinxi Town, Kunshan, Jiangsu 215324, China

2.3 Factory Information

Factory	N/A
Address	N/A

2.4 General Description for Equipment under Test (EUT)

EUT Name	Personal Ground Station
Model Name Under Test	ST10C
Series Model Name	N/A
Description of Model Name Differentiation	N/A
Hardware Version	N/A
Software Version	N/A
Dimensions (Approx.)	N/A
Weight (Approx.)	N/A
Network and Wireless connectivity	WIFI 802.11a, 802.11n(HT20), ZigBee

2.5 Ancillary Equipment

N/A

2.6 Technical Information

The requirement for the following technical information of the EUT was tested in this report:

Operating Mode	5G WLAN, ZigBee	
Frequency Range	802.11 a/n(HT20)	5150 MHz~ 5250 MHz
		5725 MHz~ 5850 MHz
	ZigBee	2400~2483.5 MHz
Antenna Type	2.4G ZigBee	PCB Antenna
	5G WLAN	Omni-directional Antenna
Hotspot Function	N/A	
Power Reduction	Not Support	
Exposure Category	General Population/Uncontrolled exposure	
EUT Stage	Portable Device	
Product	Type	
	☒ Production unit	☐ Identical prototype

3 SUMMARY OF TEST RESULT

3.1 Test Standards

No.	Identity	Document Title
1	47 CFR Part 2	Frequency Allocations and Radio Treaty Matters; General Rules and Regulations
2	ANSI/IEEE Std. C95.1-1999	IEEE Standard for Safety Levels with Respect to Human Exposure to Radio Frequency Electromagnetic Fields, 3 kHz to 300 GHz
3	IEEE Std. 1528-2013	Recommended Practice for Determining the Peak Spatial-Average Specific Absorption Rate (SAR) in the Human Head from Wireless Communications Devices: Measurement Techniques
4	FCC KDB 447498 D01 v06	Mobile and Portable Device RF Exposure Procedures and Equipment Authorization Policies
5	FCC KDB 941225 D06 v02r01	SAR Evaluation Procedures for Portable Devices with Wireless Router Capabilities
6	FCC KDB 865664 D01 v01r04	SAR Measurement 100 MHz to 6 GHz
7	FCC KDB 865664 D02 v01r02	RF Exposure Reporting
8	KDB 248227 D01 v02r02	SAR Guidance for IEEE 802.11 (Wi-Fi) Transmitters

3.2 Device Category and SAR Limit

This device belongs to portable device category because its radiating structure is allowed to be used within 20 centimeters of the body of the user.

Limit for General Population/Uncontrolled exposure should be applied for this device, it is 1.6 W/kg as averaged over any 1 gram of tissue, it is 4.0 W/kg as averaged over any 10 gram of tissue.

Table of Exposure Limits:

Body Position	SAR Value (W/Kg)	
	General Population/ Uncontrolled Exposure	Occupational/ ControlledExposure
Whole-Body SAR (averaged over the entire body)	0.08	0.4
Partial-Body SAR (averaged over any 1 gram of tissue)	1.60	8.0
SAR for hands, wrists, feet and ankles (averaged over any 10 grams of tissue)	4.0	20.0

NOTE:

General Population/Uncontrolled Exposure: Locations where there is the exposure of individuals who have no knowledge or control of their exposure. General population/uncontrolled exposure limits are applicable to situations in which the general public may be exposed or in which persons who are exposed as a consequence of their employment may not be made fully aware of the potential for exposure or cannot exercise control over their exposure. Members of the general public would come under this category when exposure is not employment-related; for example, in the case of a wireless transmitter that exposes persons in its vicinity.

Occupational/Controlled Exposure: Locations where there is exposure that may be incurred by persons who are aware of the potential for exposure, In general, occupational/controlled exposure limits are applicable to situations in which persons are exposed as a consequence of their employment, who have been made fully aware of the potential for exposure and can exercise control over their exposure. This exposure category is also applicable when the exposure is of a transient nature due to incidental passage through a location where the exposure levels may be higher than the general population/uncontrolled limits, but the exposed person is fully aware of the potential for exposure and can exercise control over his or her exposure by leaving the area or by some other appropriate means.

3.3 Test Result Summary

3.3.1 Highest SAR (1g/10g Value)

Band	Maximum Scaled SAR (W/kg)		Maximum Report SAR (W/kg)	
	Body-worn (10mm) 1g SAR	Handheld (0mm) 10g SAR	Body-worn (10mm) 1g SAR	Handheld (0mm) 10g SAR
ZigBee	0.330	**0.635**	1.119	0.635
5G WLAN	**1.119**	0.084		
Limit (W/kg)	1.60	4.0	1.6	4.0
Verdict	Pass			

3.3.2 Highest Simultaneous SAR

Position	Simultaneous Configuration	Simultaneous SAR (W/kg)	Limit (W/kg)	Verdict
Body-worn	ZigBee (Ant 180° Tip)+ 5G WLAN (Ant Mode2 Tip)	1.130	1.6	Pass
Handheld	ZigBee (Ant 180° Back)+ 5G WLAN (Ant Mode1 Back)	0.650	4.0	Pass

3.4 Test Uncertainty

According to KDB 865664 D01, When the highest measured 1 g SAR within a frequency band is < 1.5 W/kg, the extensive SAR measurement uncertainty analysis is not required in SAR reports submitted for equipment approval.

The maximum 1 g SAR for the EUT in this report is 1.119 W/kg, which is lower than 1.5 W/kg, so the extensive SAR measurement uncertainty analysis is not required in this report.

4 MEASUREMENT SYSTEM

4.1 Specific Absorption Rate (SAR) Definition

SAR is related to the rate at which energy is absorbed per unit mass in an object exposed to a radio field. The SAR distribution in a biological body is complicated and is usually carried out by experimental techniques or numerical modeling. The standard recommends limits for two tiers of groups, occupational/controlled and general population/uncontrolled, based on a person's awareness and ability to exercise control over his or her exposure. In general, occupational/controlled exposure limits are higher than the limits for general population/uncontrolled.

The SAR definition is the time derivative (rate) of the incremental energy (dW) absorbed by (dissipated in) an incremental mass (dm) contained in a volume element (dv) of a given density (ρ). The equation description is as below:

$$\mathbf{SAR} = \frac{d}{\mathrm{dt}}\left(\frac{d\mathrm{W}}{\mathrm{dm}}\right) = \frac{d}{\mathrm{dt}}\left(\frac{d\mathrm{W}}{\rho \mathrm{dv}}\right)$$

SAR is expressed in units of Watts per kilogram (W/kg) SAR measurement can be related to the electrical field in the tissue by

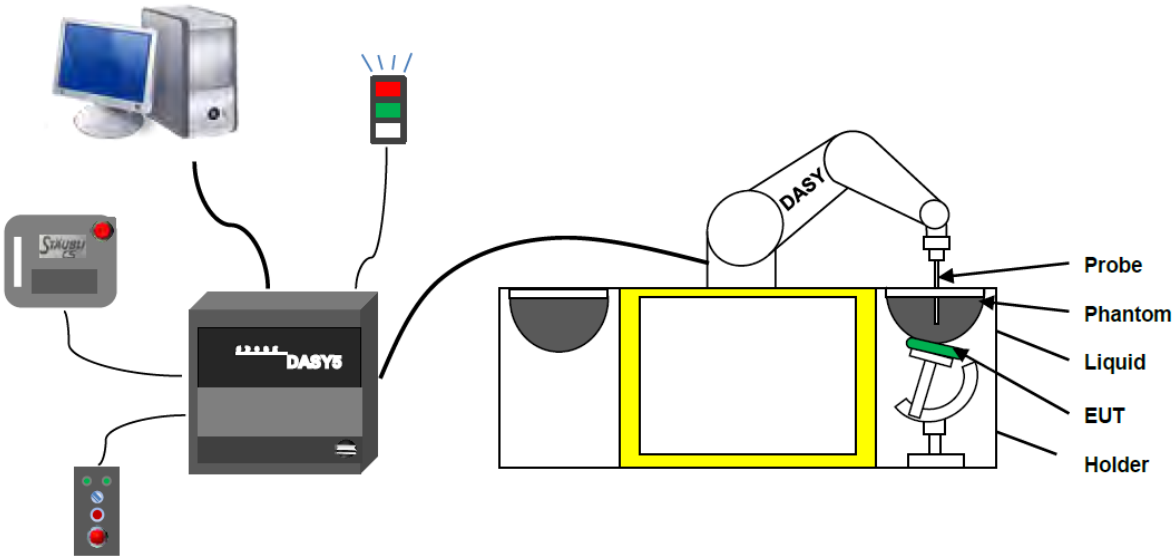
$$\mathbf{SAR} = \frac{\sigma \mathrm{E}^2}{\rho}$$

Where: σ is the conductivity of the tissue,

ρ is the mass density of the tissue and E is the RMS electrical field strength.

4.2 DASY SAR System

4.2.1 DASY SAR System Diagram



The DASY5 system for performing compliance tests consists of the following items:

1. A standard high precision 6-axis robot (Stäubli RX family) with controller and software. An arm extension for accommodating the data acquisition electronics (DAE).
2. A dosimetric probe, i.e. an isotropic E-field probe optimized and calibrated for usage in tissue simulating liquid. The probe is equipped with an optical surface detector system.
3. A data acquisition electronic (DAE) which performs the signal amplification, signal multiplexing, AD-conversion, offset measurements, mechanical surface detection, collision detection, etc. The unit is battery powered with standard or rechargeable batteries. The signal is optically transmitted to the EOC.
4. A unit to operate the optical surface detector which is connected to the EOC.
5. The Electro-Optical Coupler (EOC) performs the conversion from the optical into a digital electric signal of the DAE. The EOC is connected to the DASY5 measurement server.
6. The DASY5 measurement server, which performs all real-time data evaluation for field measurements and surface detection, controls robot movements and handles safety operation.
7. DASY5 software and SEMCAD data evaluation software.
8. Remote control with teach panel and additional circuitry for robot safety such as warning lamps, etc.
9. The generic twin phantom enabling the testing of left-hand and right-hand usage.
10. The device holder for handheld mobile phones.
11. Tissue simulating liquid mixed according to the given recipes.
12. System validation dipoles allowing to validate the proper functioning of the system.

4.2.2 Robot

The Dasy SAR system uses the high precision robots. Symmetrical design with triangular core Built-in optical fiber for surface detection system For the 6-axis controller system, Built-in shielding against static charges PEEK enclosure material (resistant to organic solvents). The robot series have many features that are important for our application:

- High precision
  (repeatability ±0.02 mm)
- High reliability
  (industrial design)
- Low maintenance costs
  (virtually maintenance free due to direct drive gears; no belt drives)
- Jerk-free straight movements
  (brush less synchron motors; no stepper motors)
- Low ELF interference
  (motor control _elds shielded via the closed metallic construction shields)

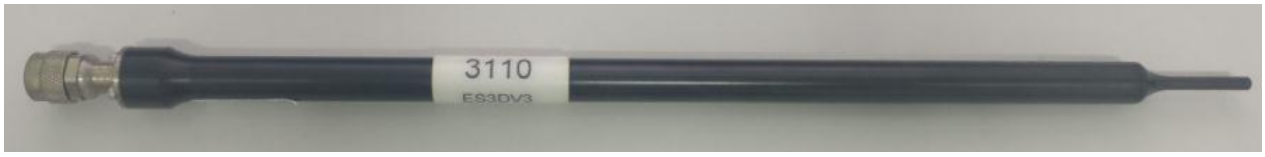
4.2.3 E-Field Probe

The probe is specially designed and calibrated for use in liquids with high permittivities for the measurements the Specific Dosimetric E-Field Probe EX3DV4-SN:7340 with following specifications is used.

Construction	Symmetrical design with triangular core Built-in optical fiber for surface detection systemBuilt-in shielding against static charges PEEK enclosure material (resistant to organic solvents, e.g., glycolether)
Calibration	ISO/IEC 17025 calibration service available
Frequency	10 MHz to 6 GHz; Linearity: ± 0.2 dB (30 MHz to 6 GHz)
Directivity	± 0.2 dB in HSL (rotation around probe axis) ; ± 0.4 dB in HSL (rotation normal to probe axis)
Dynamic range	5 µW/g to > 100 mW/g; Linearity: ± 0.2 dB
Dimensions	Overall length: 337 mm (Tip: 9 mm) Tip diameter: 2.5 mm (Body: 10 mm) Distance from probe tip to dipole centers: 1.0 mm
Application	General dosimetry up to 3 GHz Compliance tests of mobile phones Fast automatic scanning in arbitrary phantoms (EX3DV4)

The probe is specially designed and calibrated for use in liquids with high permittivities for the measurements the Specific Dosimetric E-Field Probe ES3DV3-SN:3110 with following specifications is used.

Construction	Symmetrical design with triangular core Built-in optical fiber for surface detection system Built-in shielding against static charges PEEK enclosure material (resistant to organic solvents, e.g., glycolether)
Calibration	ISO/IEC 17025 calibration service available
Frequency	10 MHz to 3 GHz; Linearity: ± 0.2 dB (30 MHz to 3 GHz)
Directivity	± 0.2 dB in HSL (rotation around probe axis) ; ± 0.4 dB in HSL (rotation normal to probe axis)
Dynamic range	5 µW/g to > 100 mW/g; Linearity: ± 0.2 dB
Dimensions	Overall length: 337 mm (Tip: 10 mm) Tip diameter: 4 mm (Body: 10 mm) Distance from probe tip to dipole centers: 2.0 mm
Application	General dosimetry up to 3 GHz Compliance tests of mobile phones Fast automatic scanning in arbitrary phantoms (ES3DV3)

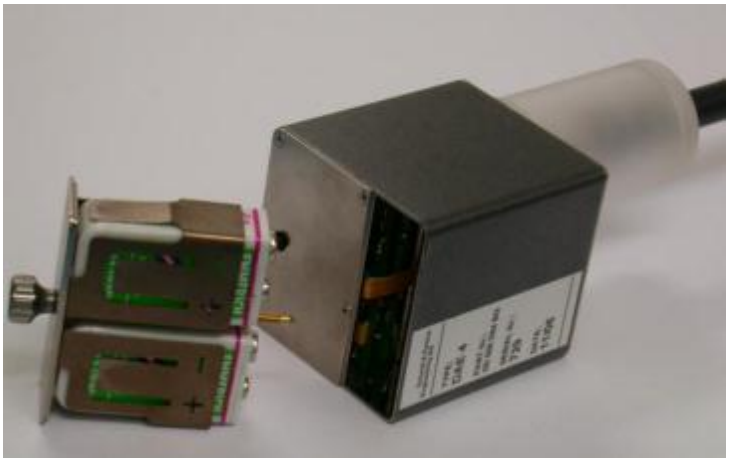


E-Field Probe Calibration Process

Probe calibration is realized, in compliance with CENELEC EN 62209-1/-2 and IEEE 1528 std, with CALISAR, Antennessa proprietary calibration system. The calibration is performed with the EN 62209-1/2 annexe technique using reference guide at the five frequencies.

4.2.4 Data Acquisition Electronics

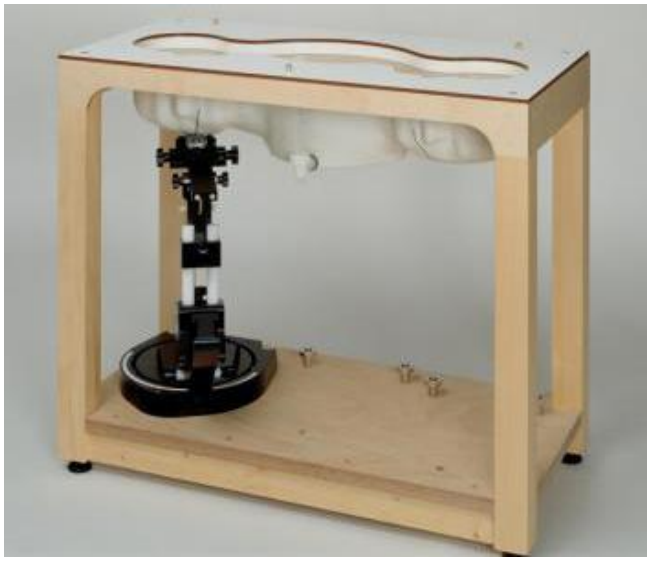
The data acquisition electronics (DAE) consist of a highly sensitive electrometer-grade preamplifier with auto-zeroing, a channel and gain-switching multiplexer, a fast 16 bit AD-converte and a command decoder with a control logic unit. Transmission to the measurement server is accomplished through an optical downlink for data and status information, as well as an optical uplink for commands and the clock.



- Input Impedance: 200MOhm
- The Inputs: Symmetrical and Floating
- Commom Mode Rejection: Above 80dB

4.2.5 Phantoms

For the measurements the Specific Anthropomorphic Mannequin (SAM) defined by the IEEE SCC-34/SC2 group is used. The phantom is a polyurethane shell integrated in a wooden table. The thickness of the phantom amounts to 2mm +/- 0.2mm. It enables the dosimetric evaluation of left and right phone usage and includes an additional flat phantom part for the simplified performance check. The phantom set-up includes a cover, which prevents the evaporation of the liquid.



- Left hand
- Right hand
- Flat phantom

Photo of Phantom SN1857

Photo of Phantom SN1859

Serial Number	Material	Length	Height
SN 1857 SAM1	Vinylester, glass fiber reinforced	1000	500
SN 1859 SAM2	Vinylester, glass fiber reinforced	1000	500

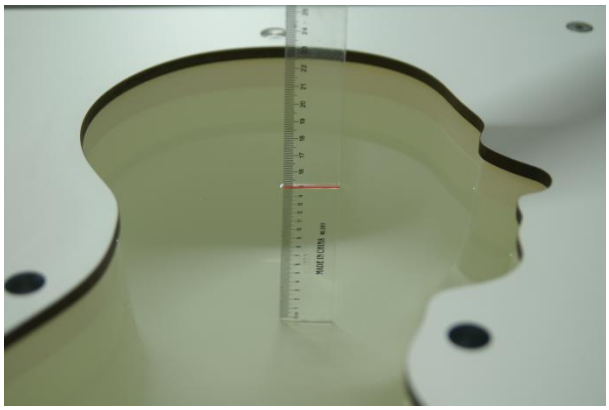
4.2.6 Device Holder

The DASY5 device holder has two scales for device rotation (with respect to the body axis) and the device inclination (with respect to the line between the ear openings). The plane between the ear openings and the mouth tip has a rotation angle of 65°. The bottom plate contains three pair of bolts for locking the device holder. The device holder positions are adjusted to the standard measurement positions in the three sections. This device holder is used for standard mobile phones or PDA"s only. If necessary an additional support of polystyrene material is used. Larger DUT"s (e.g. notebooks) cannot be tested using this device holder. Instead a support of bigger polystyrene cubes and thin polystyrene plates is used to position the DUT in all relevant positions to find and measure spots with maximum SAR values. Therefore those devices are normally only tested at the flat part of the SAM.

The positioning system allows obtaining cheek and tilting position with a very good accuracy. Incompliance with CENELEC, the tilt angle uncertainty is lower than 1°.

4.2.7 Simulating Liquid

For SAR measurement of the field distribution inside the phantom, the phantom must be filled with homogeneous tissue simulating liquid to a depth of at least 15 cm. For head SAR testing, the liquid height from the ear reference point (ERP) of the phantom to the liquid top surface is larger than 15 cm. For body SAR testing, the liquid height from the center of the flat phantom to the liquid top surface is larger than 15 cm. The nominal dielectric values of the tissue simulating liquids in the phantom and the tolerance of 5%.

Head Liquid Depth	Body Liquid Depth
	

The following table gives the recipes for tissue simulating liquid and the theoretical Conductivity/Permittivity.

Head (Reference IEEE1528)								
Frequency (MHz)	Water (%)	Sugar (%)	Cellulose (%)	Salt (%)	Preventol (%)	DGBE (%)	Conductivity σ (S/m)	Permittivity ε
750	41.1	57.0	0.2	1.4	0.2	0	0.89	41.9
835	40.3	57.9	0.2	1.4	0.2	0	0.90	41.5
900	40.3	57.9	0.2	1.4	0.2	0	0.97	41.5
1800, 1900, 2000	55.2	0	0	0.3	0	44.5	1.4	40.0
2450	55.0	0	0	0.1	0	44.9	1.80	39.2
2600	54.9	0	0	0.1	0	45.0	1.96	39.0
Frequency (MHz)	Water (%)	Hexyl Carbitol (%)			Triton X-100 (%)		Conductivity σ (S/m)	Permittivity ε
5200	62.52	17.24			17.24		4.66	36.0
5800	62.52	17.24			17.24		5.27	35.3
Body (From instrument manufacturer)								
Frequency (MHz)	Water (%)	Sugar (%)	Cellulose (%)	Salt (%)	Preventol (%)	DGBE (%)	Conductivity σ (S/m)	Permittivity ε
750	51.7	47.2	0	0.9	0.1	0	0.96	55.5
835	50.8	48.2	0	0.9	0.1	0	0.97	55.2
900	50.8	48.2	0	0.9	0.1	0	1.05	55.0
1800, 1900, 2000	70.2	0	0	0.4	0	29.4	1.52	53.3
2450	68.6	0	0	0.1	0	31.3	1.95	52.7
2600	68.2	0	0	0.1	0	31.7	2.16	52.5
Frequency(MHz)	Water	DGBE (%)			Salt (%)		Conductivity σ (S/m)	Permittivity ε
5200	78.60	21.40			/		5.54	47.86
5800	78.50	21.40			0.1		6.0	48.20

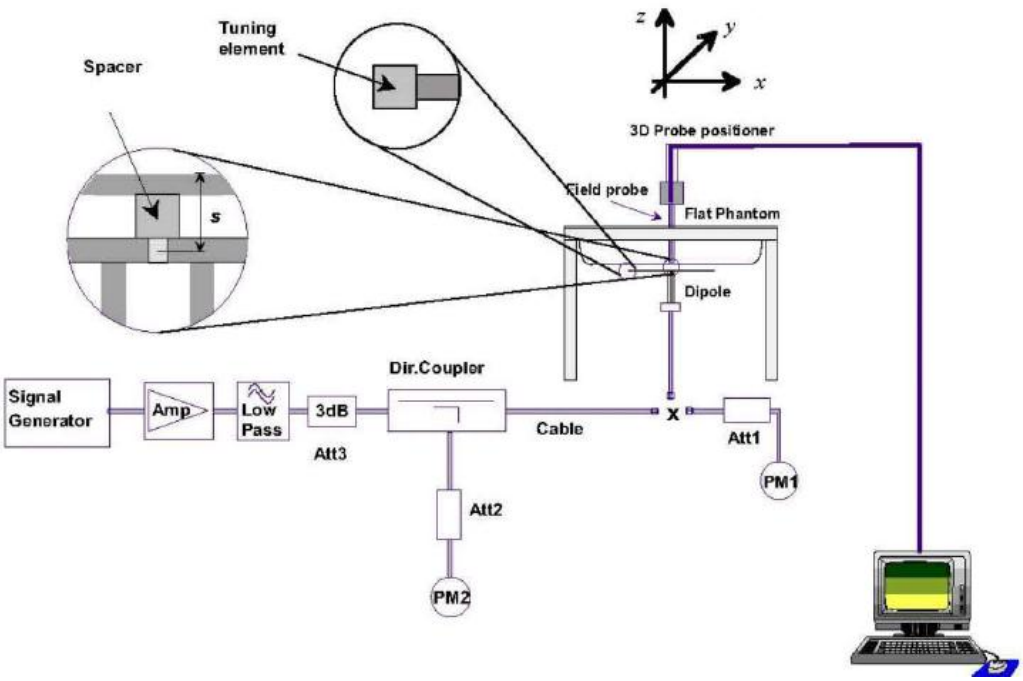
5 SYSTEM VERIFICATION

5.1 Purpose of System Check

The system performance check verifies that the system operates within its specifications. System and operator errors can be detected and corrected. It is recommended that the system performance check be performed prior to any usage of the system in order to guarantee reproducible results. The system performance check uses normal SAR measurements in a simplified setup with a well characterized source.This setup was selected to give a high sensitivity to all parameters that might fail or vary over time. The system check does not intend to replace the calibration of the components, but indicates situations where the system uncertainty is exceeded due to drift or failure.

5.2 System Check Setup

In the simplified setup for system evaluation, the EUT is replaced by a calibrated dipole and the power source is replaced by a continuous wave that comes from a signal generator. The calibrated dipole must be placed beneath the flat phantom section of the SAM twin phantom with the correct distance holder. The distance holder should touch the phantom surface with a light pressure at the reference marking and be oriented parallel to the long side of the phantom. The equipment setup is shown below:



6 TEST POSITION CONFIGURATIONS

According to KDB 648474 D04 Handset, handsets are tested for SAR compliance in head, body-worn accessory and other use configurations described in the following subsections.

6.1 Head Exposure Conditions

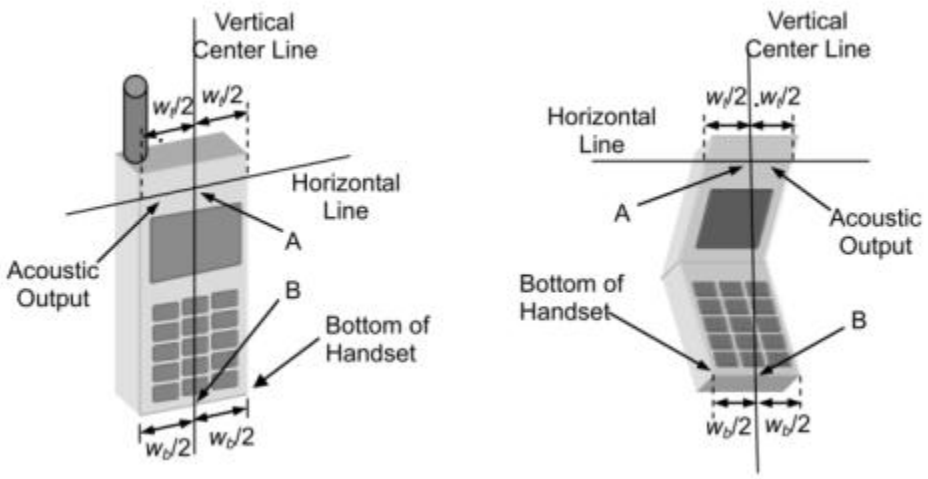
Head exposure is limited to next to the ear voice mode operations. Head SAR compliance is tested according to the test positions defined in IEEE Std 1528-2013 using the SAM phantom illustrated as below.

6.1.1 Two Imaginary Lines on the Handset

(a) The vertical center line passes through two points on the front side of the handset - the midpoint of the width w t of the handset at the level of the acoustic output, and the midpoint of the width w b of the bottom of the handset.

(b) The horizontal line is perpendicular to the vertical centerline and passes through the center of the acoustic output. The horizontal line is also tangential to the face of the handset at point A.

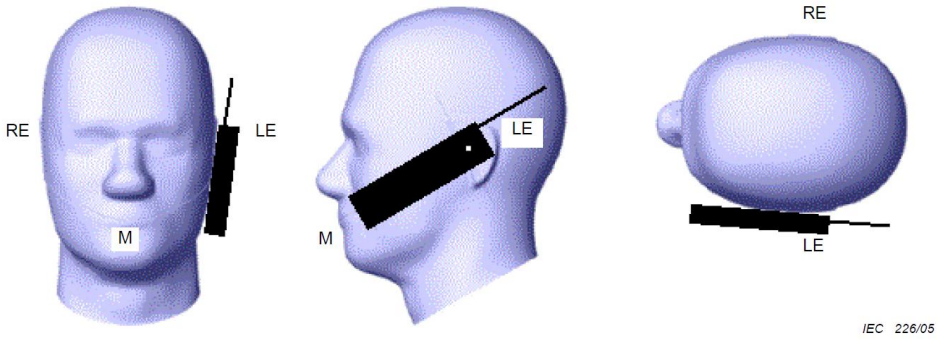
(c) The two lines intersect at point A. Note that for many handsets, point A coincides with the center of the acoustic output; however, the acoustic output may be located elsewhere on the horizontal line. Also note that the vertical center line is not necessarily parallel to the front face of the handset, especially for clamshell handsets, handsets with flip covers, and other irregularly shaped handsets.



6.1.2 Cheek Position

(a) To position the device with the vertical center line of the body of the device and the horizontal line crossing the center piece in a plane parallel to the sagittal plane of the phantom. While maintaining the device in this plane, align the vertical center line with the reference plane containing the three ear and mouth reference point (M: Mouth, RE: Right Ear, and LE: Left Ear) and align the center of the ear piece with the line RE-LE.

(b) To move the device towards the phantom with the ear piece aligned with the line LE-RE until the phone touched the ear. While maintaining the device in the reference plane and maintaining the phone contact with the ear, move the bottom of the phone until any point on the front side is in contact with the cheek of the phantom or until contact with the ear is lost.



6.1.3 Tilted Position

(a) To position the device in the “cheek” position described above.

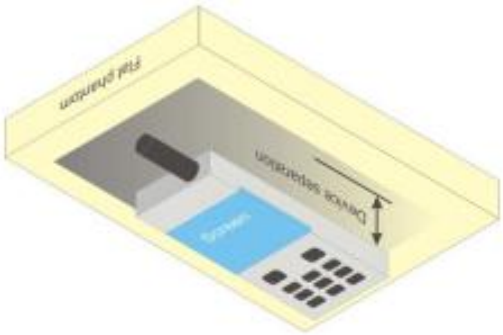
(b) While maintaining the device the reference plane described above and pivoting against the ear, moves it outward away from the mouth by an angle of 15 degrees or until contact with the ear is lost.

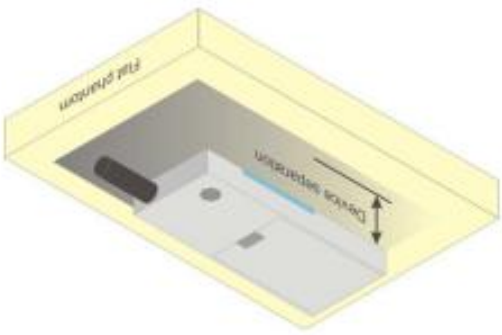
6.2 Body-worn Position Conditions

Body-worn accessory exposure is typically related to voice mode operations when handsets are carried in body-worn accessories. The body-worn accessory procedures in KDB 447498 are used to test for body-worn accessory SAR compliance, without a headset connected to it. This enables the test results for such configuration to be compatible with that required for hotspot mode when the body-worn accessory test separation distance is greater than or equal to that required for hotspot mode. When the reported SAR for a body-worn accessory.

Body-worn accessories that do not contain metallic or conductive components may be tested according to worst-case exposure configurations, typically according to the smallest test separation distance required for the group of body-worn accessories with similar operating and exposure characteristics. All body-worn accessories containing metallic components are tested in conjunction with the host device.

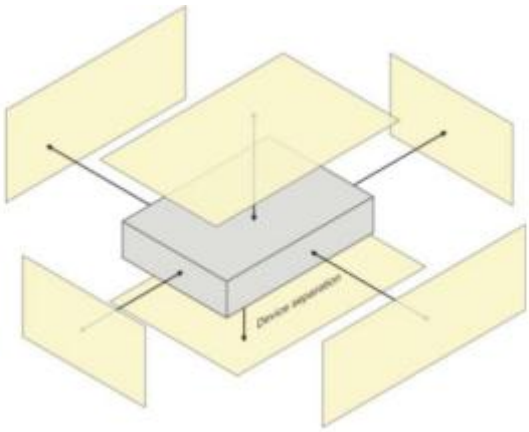
Body-worn accessory SAR compliance is based on a single minimum test separation distance for all wireless and operating modes applicable to each body-worn accessory used by the host, and according to the relevant voice and/or data mode transmissions and operations. If a body-worn accessory supports voice only operations in its normal and expected use conditions, testing of data mode for body-worn compliance is not required. A conservative minimum test separation distance for supporting off-the-shelf body-worn accessories that may be acquired by users of consumer handsets is used to test for body-worn accessory SAR compliance. This distance is determined by the handset manufacturer, according to the requirements of Supplement C 01-01. Devices that are designed to operate on the body of users using lanyards and straps, or without requiring additional body-worn accessories, will be tested using a conservative minimum test separation distance <= 5 mm to support compliance.





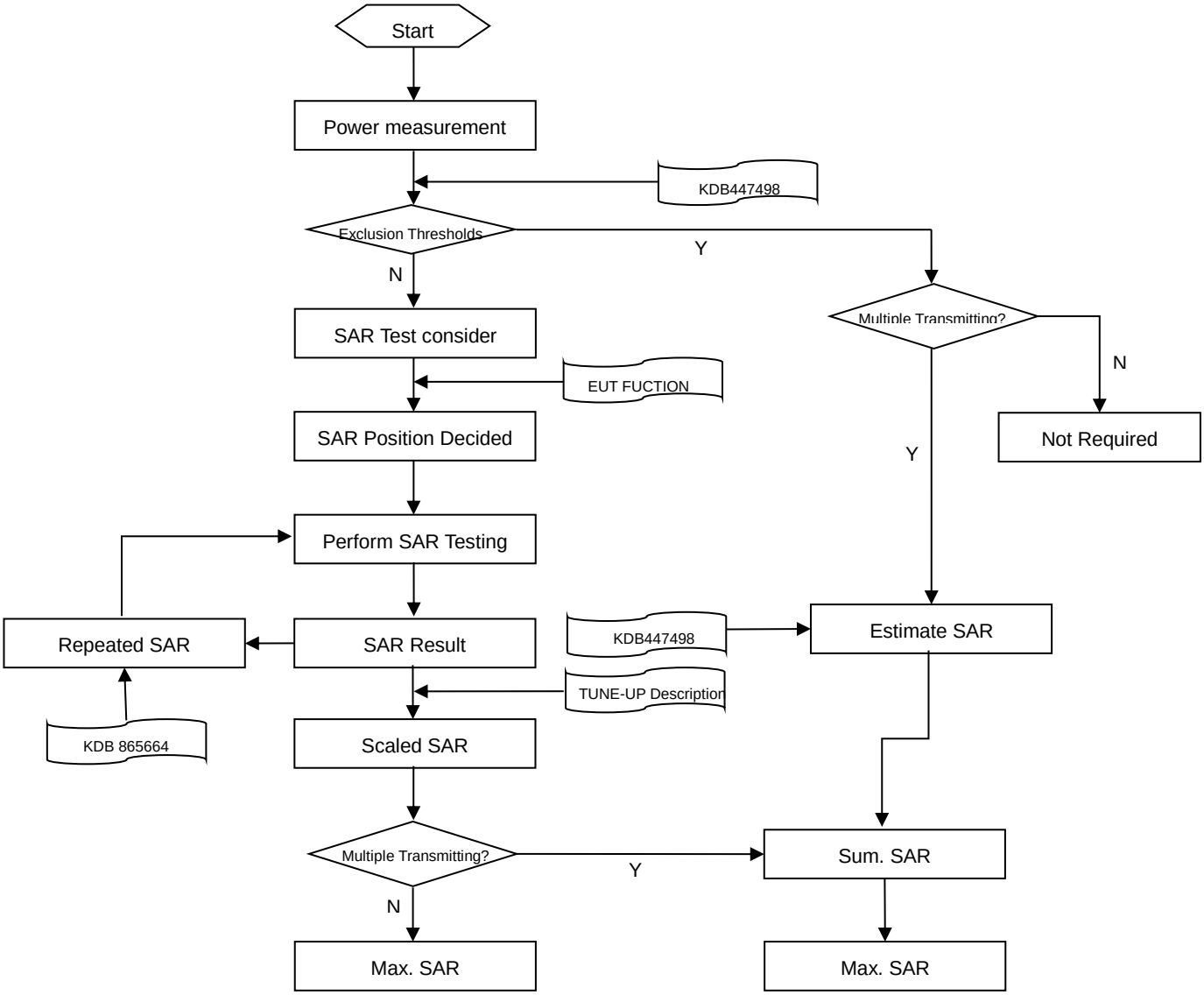
6.3 Hotspot Mode Exposure Position Conditions

For handsets that support hotspot mode operations, with wireless router capabilities and various web browsing functions, the relevant hand and body exposure conditions are tested according to the hotspot SAR procedures in KDB 941225. A test separation distance of 10 mm is required between the phantom and all surfaces and edges with a transmitting antenna located within 25 mm from that surface or edge. When the form factor of a handset is smaller than 9 cm x 5 cm, a test separation distance of 5 mm (instead of 10 mm) is required for testing hotspot mode. When the separation distance required for body-worn accessory testing is larger than or equal to that tested for hotspot mode, in the same wireless mode and for the same surface of the phone, the hotspot mode SAR data may be used to support body-worn accessory SAR compliance for that particular configuration (surface).



7 MEASUREMENT PROCEDURE

7.1 Measurement Process Diagram



7.2 SAR Scan General Requirement

Probe boundary effect error compensation is required for measurements with the probe tip closer than half a probe tip diameter to the phantom surface. Boththe probe tip diameter and sensor offset distance must satisfy measurement protocols; to ensure probe boundary effect errors are minimized and the higher fields closest to the phantom surface can be correctly measured and extrapolated to the phantom surface for computing 1 g SAR. Tolerances of the post-processing algorithms must be verified by the test laboratory for the scan resolutions used in the SAR measurements, according to the reference distribution functions specified in IEEE Std 1528-2013.

<table>
<tr><th colspan="3"></th><th>≤3GHz</th><th>>3GHz</th></tr>
<tr><td colspan="3">Maximum distance from closest measurement point (geometric center of probe sensors) to phantom surface</td><td>5±1 mm</td><td>½·δ·ln(2)±0.5 mm</td></tr>
<tr><td colspan="3">Maximum probe angle from probe axis to phantom surface normal at the measurement location</td><td>30°±1°</td><td>20°±1°</td></tr>
<tr><td colspan="3" rowspan="2">Maximum area scan spatial resolution: Δx Area , Δy Area</td><td>≤ 2 GHz: ≤ 15 mm
2 – 3 GHz: ≤ 12 mm</td><td>3–4 GHz: ≤ 12 mm
4 – 6 GHz: ≤ 10 mm</td></tr>
<tr><td colspan="2">When the x or y dimension of the test device, in the measurement plane orientation, is smaller than the above, the measurement resolution must be ≤ the corresponding x or y dimension of the test device with at least one measurement point on the test device.</td></tr>
<tr><td colspan="3">Maximum zoom scan spatial resolution: Δx Zoom , Δy Zoom</td><td>≤ 2 GHz: ≤ 8 mm
2 –3 GHz: ≤ 5 mm*</td><td>3–4 GHz: ≤ 5 mm*
4 – 6 GHz: ≤ 4 mm*</td></tr>
<tr><td rowspan="7">Maximum zoom scan spatial resolution, normal to phantom surface</td><td colspan="2" rowspan="3">uniform grid: Δz Zoom (n)</td><td rowspan="3">≤ 5 mm</td><td>3–4 GHz: ≤ 4 mm</td></tr>
<tr><td>4–5 GHz: ≤ 3 mm</td></tr>
<tr><td>5–6 GHz: ≤ 2 mm</td></tr>
<tr><td rowspan="3">graded grid</td><td rowspan="2">Δz Zoom (1): between 1st two points closest to phantom surface</td><td rowspan="3">≤ 4 mm</td><td>3–4 GHz: ≤ 3 mm</td></tr>
<tr><td>4–5 GHz: ≤ 2.5 mm</td></tr>
<tr><td>5–6 GHz: ≤ 2 mm</td></tr>
<tr><td>Δz Zoom (n>1): between subsequent points</td><td colspan="2">≤ 1.5·Δz Zoom (n-1)</td></tr>
<tr><td rowspan="3">Minimum zoom scan volume</td><td colspan="2" rowspan="3">x, y, z</td><td rowspan="3">≥30 mm</td><td>3–4 GHz: ≥ 28 mm</td></tr>
<tr><td>4–5 GHz: ≥ 25 mm</td></tr>
<tr><td>5–6 GHz: ≥ 22 mm</td></tr>
</table>

Note:

1. δ is the penetration depth of a plane-wave at normal incidence to the tissue medium; see draft standard IEEE P1528-2011 for details.
2. * When zoom scan is required and the reported SAR from the area scan based 1 g SAR estimation procedures of KDB 447498 is ≤ 1.4 W/kg, ≤ 8 mm, ≤ 7 mm and ≤ 5 mm zoom scan resolution may be applied, respectively, for 2 GHz to 3GHz, 3 GHz to 4 GHz and 4 GHz to 6 GHz.

7.3 Measurement Procedure

The following steps are used for each test position

a. Establish a call with the maximum output power with a base station simulator. The connection between the mobile and the base station simulator is established via air interface

b. Measurement of the local E-field value at a fixed location. This value serves as a reference value for calculating a possible power drift.

c. Measurement of the SAR distribution with a grid of 8 to 16mm * 8 to16 mm and a constant distance to the inner surface of the phantom. Since the sensors cannot directly measure at the inner phantom surface, the values between the sensors and the inner phantom surface are extrapolated. With these values the area of the maximum SAR is calculated by an interpolation scheme.

d. Around this point, a cube of 30 * 30 * 30 mm or 32 * 32 *32 mm is assessed by measuring 5 or 8 * 5 or 8*4 or 5 mm. With these data, the peak spatial-average SAR value can be calculated.

7.4 Area & Zoom Scan Procedure

First Area Scan is used to locate the approximate location(s) of the local peak SAR value(s). The measurement grid within an Area Scan is defined by the grid extent, grid step size and grid offset. Next, in order to determine the EM field distribution in a three-dimensional spatial extension, Zoom Scan is required. The Zoom Scan is performed around the highest E-field value to determine the averaged SAR-distribution over 10 g. Area scan and zoom scan resolution setting follows KDB 865664 D01v01r04 quoted below.

When the 1 g SAR of the highest peak is within 2 dB of the SAR limit, additional zoom scans are required for other peaks within 2 dB of the highest peak that have not been included in any zoom scan to ensure there is no increase in SAR.

8 CONDUCTED RF OUPUT POWER

8.1 ZigBee

Band (GHz)	Mode	Channel	Freq. (MHz)	Avg. Power (dBm)	Tune-up Limit (dBm)	SAR Test Require.
2.4 (2.4~2.4835)	802.15.4	CH 11	2405	**17.75**	18.00	Yes
		CH 18	2440	**17.75**	18.00	Yes
		CH 25	2475	17.27	18.00	Yes

8.2 5G WLAN

Band (GHz)	Mode	Channel	Freq. (MHz)	Avg. Power (dBm)	Tune-up Limit (dBm)	SAR Test Require.
5.2 (5.150~5.250)	802.11a	36	5180	17.41	18.00	Yes
		44	5220	**17.88**	18.00	Yes
		48	5240	17.24	18.00	Yes
	802.11n(HT20)	36	5180	17.59	18.00	No
		44	5220	17.47	18.00	No
		48	5240	17.35	18.00	No
5.8 (5.725~5.850)	802.11a	149	5745	17.43	18.00	Yes
		157	5785	17.55	18.00	Yes
		165	5825	**17.81**	18.00	Yes
	802.11n(HT20)	149	5745	17.70	18.00	No
		157	5785	17.76	18.00	No
		165	5825	17.90	18.00	No

9 TEST EXCLUSION CONSIDERATION

Please refer the document “EUT Antenna Location and Configuration.pdf”.

9.1 SAR Test Exclusion Consideration Table

According with FCC KDB 447498 D01, Appendix A, <SAR Test Exclusion Thresholds for 100 MHz – 6 GHz and ≤ 50 mm> Table, this Device SAR test configurations consider as following :

Band	Mode	Max. Peak Power		Test Position Configurations					
		dBm	mW	Front	Back	Left Edge	Right Edge	Top	Bottom
ZigBee	Distance to User			38mm	<5mm	25mm	110mm	<5mm	102mm
	802.15.4	18.00	63.10	Yes	Yes	Yes	No	Yes	No
WLAN 5.2 G	Distance to User			<5mm	<5mm	50mm	50mm	<5mm	102mm
	802.11a	18.00	63.10	Yes	Yes	Yes	Yes	Yes	No
	802.11n(HT20)	18.00	63.10	No	No	No	No	No	No
WLAN 5.8 G	Distance to User			<5mm	<5mm	50mm	50mm	<5mm	102mm
	802.11a	18.00	63.10	Yes	Yes	Yes	Yes	Yes	No
	802.11n(HT20)	18.00	63.10	No	No	No	No	No	No

Note:

1. Maximum power is the source-based time-average power and represents the maximum RF output power including tune-up tolerance among production units
2. Per KDB 447498 D01, for larger devices, the test separation distance of adjacent edge configuration is determined by the closest separation between the antenna and the user.
3. Per KDB 447498 D01, standalone SAR test exclusion threshold is applied; If the distance of the antenna to the user is < 5mm, 5mm is used to determine SAR exclusion threshold
4. Per KDB 447498 D01, the 1-g and 10-g SAR test exclusion thresholds for 100 MHz to 6 GHz at test separation distances ≤ 50 mm are determined by:
   [(max. power of channel, including tune-up tolerance, mW)/(min. test separation distance, mm)] ·[√f(GHz)] ≤ 3.0 for 1-g SAR and ≤ 7.5 for 10-g extremity SAR
   a. f(GHz) is the RF channel transmit frequency in GHz
   b. Power and distance are rounded to the nearest mW and mm before calculation
   c. The result is rounded to one decimal place for comparison
   d. For < 50 mm distance, we just calculate mW of the exclusion threshold value (3.0) to do compare.

   This formula is [3.0] / [√f(GHz)] ·[(min. test separation distance, mm)] = exclusion threshold of mW.
5. Per KDB 447498 D01, at 100 MHz to 6 GHz and for test separation distances > 50 mm, the SAR test exclusion threshold is determined according to the following
   a. [Threshold at 50 mm in step 1) + (test separation distance - 50 mm)·(f(MHz)/150)] mW, at 100 MHz to 1500 MHz
   b. [Threshold at 50 mm in step 1) + (test separation distance - 50 mm)·10] mW at > 1500 MHz and ≤ 6 GHz
6. Per KDB 248227 D01 SAR when multiple transmission modes (802.11a/g/n/ac) have the same specified maximum output power, largest channel bandwidth, lowest order modulation and lowest data rate, lowest order 802.11 mode is selected (i.e. a, g, n, then ac).

10 TEST RESULT

10.1 ZigBee 2.4GHz (1g SAR)

Mode	Position	Antenna Status	Dist. (mm)	Ch.	Freq. (MHz)	Power Drift (dB)	1 g Meas. SAR (W/Kg)	Meas. Power (dBm)	Max. tune-up Power (dBm)	Scaling Factor	Duty Cycle (%)	Duty Cycle Scaling Factor	1 g Scaled SAR (W/Kg)	Meas. No.
Body-worn														
802.15.4	Back	2.4G Ant 0°	10	11	2405	-0.03	0.046	17.75	18.00	1.059	18.95	5.277	0.257	/
	Back	2.4G Ant 180°	10	11	2405	0.04	0.051	17.75	18.00	1.059	18.95	5.277	0.286	/
			10	18	2440	-0.05	0.052	17.75	18.00	1.059	18.95	5.277	0.291	/
			10	25	2475	0.12	0.053	17.27	18.00	1.183	18.95	5.277	**0.330**	1#
	Top	2.4G Ant 90°	10	11	2405	0.02	0.024	17.75	18.00	1.059	18.95	5.277	0.136	/
	Left Edge	2.4G Ant 180°	10	11	2405	0.01	0.006	17.75	18.00	1.059	18.95	5.277	0.034	/
	Tip	2.4G Ant 180°	10	11	2405	0.09	0.002	17.75	18.00	1.059	18.95	5.277	0.011	/

10.2 ZigBee 2.4GHz (10g SAR)

Mode	Position	Antenna Status	Dist. (mm)	Ch.	Freq. (MHz)	Power Drift (dB)	10 g Meas. SAR (W/Kg)	Meas. Power (dBm)	Max. tune-up Power (dBm)	Scaling Factor	Duty Cycle (%)	Duty Cycle Scaling Factor	10 g Scaled SAR (W/Kg)	Meas. No.
Handheld														
802.15.4	Back	2.4G Ant 0°	0	11	2405	-0.19	0.083	17.75	18.00	1.059	18.95	5.277	0.462	/
	Back	2.4G Ant 180°	0	11	2405	0.03	0.090	17.75	18.00	1.059	18.95	5.277	0.504	/
			0	18	2440	0.16	0.093	17.27	18.00	1.183	18.95	5.277	0.581	/
			0	25	2475	0.06	0.102	17.28	18.00	1.180	18.95	5.277	**0.635**	2#
	Top	2.4G Ant 90°	0	11	2405	0.05	0.082	17.75	18.00	1.059	18.95	5.277	0.457	/
	Front	2.4G Ant 0°	0	11	2405	0.19	0.003	17.75	18.00	1.059	18.95	5.277	0.019	/
	Front	2.4G Ant 180°	0	11	2405	0.08	0.006	17.75	18.00	1.059	18.95	5.277	0.032	/
	Left Edge	2.4G Ant 180°	0	11	2405	0.03	0.005	17.75	18.00	1.059	18.95	5.277	0.027	/

10.3 WIFI 5GHz (1g SAR)

Fre. Band	Mode	Position	Antenna Status	Dist. (mm)	Ch.	Freq. (MHz)	Power Drift (%)	1 g Meas. SAR (W/Kg)	Meas. Power (dBm)	Max. tune-up Power (dBm)	Scaling Factor	Duty Cycle (%)	Duty Cycle Scaling Factor	1 g Scaled SAR (W/Kg)	Meas. No.
Body-worn															
5.2G	802.11 a	Back	5G Ant Mode 1	10	44	5220	-0.02	0.021	17.88	18.00	1.028	94.45	1.059	0.023	/
		Left Edge	5G Ant Mode 1	10	44	5220	0.14	0.002	17.88	18.00	1.028	94.45	1.059	0.002	/
		Right Edge	5G Ant Mode 1	10	44	5220	0.02	0.003	17.88	18.00	1.028	94.45	1.059	0.003	/
		Tip	5G Ant Mode 2	10	44	5220	0.16	0.662	17.88	18.00	1.028	94.45	1.059	0.721	/
				10	36	5180	0.02	0.408	17.41	18.00	1.146	94.45	1.059	0.495	/
				10	48	5240	0.11	0.887	17.24	18.00	1.191	94.45	1.059	**1.119**	3#
5.8G	802.11 a	Back	5G Ant Mode 1	10	165	5825	-0.13	0.023	17.81	18.00	1.045	94.45	1.059	0.025	/
		Left Edge	5G Ant Mode 1	10	165	5825	0.01	0.003	17.81	18.00	1.045	94.45	1.059	0.003	/
		Right Edge	5G Ant Mode 1	10	165	5825	0.11	0.004	17.81	18.00	1.045	94.45	1.059	0.004	/
		Tip	5G Ant Mode 2	10	165	5825	0.05	0.979	17.81	18.00	1.045	94.45	1.059	**1.083**	4#
				10	149	5745	0.17	0.880	17.43	18.00	1.140	94.45	1.059	1.062	/
				10	157	5785	0.08	0.724	17.55	18.00	1.109	94.45	1.059	0.850	/

10.4WIFI 5GHz (10g SAR)

Fre. Band	Mode	Position	Antenna Status	Dist. (mm)	Ch.	Freq. (MHz)	Power Drift (%)	10 g Meas. SAR (W/Kg)	Meas. Power (dBm)	Max. tune-up Power (dBm)	Scaling Factor	Duty Cycle (%)	Duty Cycle Scaling Factor	10 g Scaled SAR (W/Kg)	Meas. No.
Handheld															
5.2G	802.11 a	Back	5G Ant Mode 1	0	44	5220	0.13	0.012	17.88	18.00	1.028	94.45	1.059	0.013	/
		Front	5G Ant Mode 3	0	44	5220	0.15	0.045	17.88	18.00	1.028	94.45	1.059	0.049	/
				0	36	5180	0.02	0.028	17.41	18.00	1.146	94.45	1.059	0.034	/
				0	48	5240	-0.19	0.052	17.24	18.00	1.191	94.45	1.059	**0.066**	5#
		Left Edge	5G Ant Mode 1	0	44	5220	0.03	0.002	17.88	18.00	1.028	94.45	1.059	0.002	/
		Right Edge	5G Ant Mode 1	0	44	5220	0.14	0.003	17.88	18.00	1.028	94.45	1.059	0.003	/
5.8G	802.11 a	Back	5G Ant Mode 1	0	165	5825	0.09	0.014	17.81	18.00	1.045	94.45	1.059	0.015	/
		Front	5G Ant Mode 3	0	165	5825	-0.10	0.076	17.81	18.00	1.045	94.45	1.059	**0.084**	6#
				0	149	5745	-0.11	0.062	17.43	18.00	1.140	94.45	1.059	0.075	/
				0	157	5785	-0.15	0.065	17.55	18.00	1.109	94.45	1.059	0.076	/
		Left Edge	5G Ant Mode 1	0	165	5825	-0.12	0.002	17.81	18.00	1.045	94.45	1.059	0.002	/
		Right Edge	5G Ant Mode 1	0	165	5825	-0.03	0.005	17.81	18.00	1.045	94.45	1.059	0.006	/

11 SAR Measurement Variability

According to KDB 865664 D01, SAR measurement variability was assessed for each frequency band, which is determined by the SAR probe calibration point and tissue-equivalent medium used for the device measurements. When both head and body tissue-equivalent media are required for SAR measurements in a frequency band, the variability measurement procedures should be applied to the tissue medium with the highest measured SAR, using the highest measured SAR configuration for that tissue-equivalent medium. Alternatively, if the highest measured SAR for both head and body tissue-equivalent media are ≤ 1.45 W/kg and the ratio of these highest SAR values, i.e., largest divided by smallest value, is ≤ 1.10, the highest SAR configuration for either head or body tissue-equivalent medium may be used to perform the repeated measurement. These additional measurements are repeated after the completion of all measurements requiring the same head or body tissue-equivalent medium in a frequency band. The test device should be returned to ambient conditions (normal room temperature) with the battery fully charged before it is re-mounted on the device holder for the repeated measurement(s) to minimize any unexpected variations in the repeated results.

SAR repeated measurement procedure:

1. When the highest measured SAR is < 0.80 W/kg, repeated measurement is not required.
2. When the highest measured SAR is >= 0.80 W/kg, repeat that measurement once.
3. If the ratio of largest to smallest SAR for the original and first repeated measurements is > 1.20, or when the original or repeated measurement is >= 1.45 W/kg, perform a second repeated measurement.
4. If the ratio of largest to smallest SAR for the original, first and second repeated measurements is > 1.20, and the original, first or second repeated measurement is >= 1.5 W/kg, perform a third repeated measurement.

Frequency Band (MHz)	Wireless Band	RF Exposure Conditions	Test Position	Highest Measured SAR (W/kg)	Repeated SAR (Yes/No)	Highest Measured SAR (W/kg)	Largest to Smallest SAR Radio
5200	WIFI 802.11 a	Body	Tip	0.887	Yes	0.855	1.04
5800	WIFI 802.11 a	Body	Tip	0.979	Yes	0.926	1.06
Note: the ratio of largest to smallest SAR for the original and first repeated measurements is < 1.20, the second repeated measurement is not required.							

12 SIMULTANEOUS TRANSMISSION

Simultaneous transmission SAR test exclusion is determined for each operating configuration and exposure condition according to the reported standalone SAR of each applicable simultaneous transmitting antenna. When the sum of SAR 1g of all simultaneously transmitting antennas in an operating mode and exposure condition combination is within the SAR limit (SAR 1g 1.6 W/kg), the simultaneous transmission SAR is not required. When the sum of SAR 1g is greater than the SAR limit (SAR 1g 1.6 W/kg), SAR test exclusion is determined by the SAR to Peak Location Ratio (SPLSR).

12.1 Simultaneous Transmission Mode Consider

NO.	Mode	5G WLAN & 2.4G ZigBee	
		Body-worn	Handheld
1	ZigBee	+ 5G WLAN	+ 5G WLAN

12.2 Sum SAR of Simultaneous Transmission

12.2.1 Sum Body Worn Mode SAR of Simultaneous Transmission

2.4G ZigBee SAR		5G Wi-Fi SAR		Simultaneous SAR Value		
Ant Mode	Channel	Ant Mode	Channel	2.4G SAR	5G SAR	Sum SAR
Ant 180° Tip	11	Ant Mode2 Tip	11a Ch.48	0.011	1.119	**1.130**
Ant 0° Back	11	Ant Mode1 Back	11a Ch.165	0.257	0.025	0.282
Ant 180° Back	25	Ant Mode1 Back	11a Ch.165	0.330	0.025	0.355
Ant 180° Left Edge	11	Ant Mode1 Left Edge	11a Ch.165	0.034	0.003	0.037
Ant 180° Right Edge	11	Ant Mode1 Right Edge	11a Ch.165	0.000	0.004	0.004

12.2.2 Sum Handheld Mode SAR of Simultaneous Transmission

2.4G ZigBee SAR		5G Wi-Fi SAR		Simultaneous SAR Value		
Ant Mode	Channel	Ant Mode	Channel	2.4G SAR	5G SAR	Sum SAR
Ant 0° Back	11	Ant Mode1 Back	11a Ch.165	0.462	0.015	0.477
Ant 180° Back	25	Ant Mode1 Back	11a Ch.165	0.635	0.015	**0.650**
Ant 180° Front	11	Ant Mode3 Front	11a Ch.165	0.032	0.084	0.116
Ant 180° Left Edge	11	Ant Mode1 Left Edge	11a Ch.165	0.027	0.002	0.029
Ant 180° Right Edge	11	Ant Mode1 Right Edge	11a Ch.165	0.000	0.006	0.006

13 TEST EQUIPMENTS LIST

Description	Manufacturer	Model	Serial No.	Cal. Date	Cal. Due
PC	Dell	N/A	N/A	N/A	N/A
2450MHz Validation Dipole	Speag	D2450V2	SN: 952	2017/03/21	2020/03/20
5GHz Validation Dipole	Speag	D5GHzV2	SN: 1200	2017/06/29	2020/06/28
E-Field Probe	Speag	EX3DV4	SN: 7340	2018/01/11	2019/01/10
E-Field Probe	Speag	ES3DV3	SN: 3110	2017/08/02	2018/08/01
Data Acquisition Electronics	Speag	DAE4	SN: 685	2017/08/02	2018/08/01
Signal Generator	R&S	SMBV100A	260592	2017/06/12	2018/06/11
Power Meter	Agilent	E4419B	GB40201833	2017/11/02	2018/11/01
Power Sensor	Agilent	E9300A	MY41498012	2017/11/02	2018/11/01
Power Sensor	Agilent	E9300A	MY41499891	2017/11/02	2018/11/01
Power Amplifier	SATIMO	6552B	22374	2017/06/12	2018/06/11
Network Analyzer	Agilent	5071B	MY42404001	2017/06/12	2018/06/11
Thermometer	Elitech	RC-4HC	N/A	2017/11/13	2018/11/12
Phantom1	Speag	SAM	SN: 1859	N/A	N/A
Phantom2	Speag	SAM	SN: 1857	N/A	N/A
Attenuator	COM-MW	ZA-S1-31	1305003187	N/A	N/A
Directional coupler	AA-MCS	AAMCS-UDC	000272	N/A	N/A
Power Amplifier	SATIMO	6552B	22374	N/A	N/A
Dielectric Probe Kit	SATIMO	SCLMP	SN 25/13 OCPG56	N/A	N/A

Note:

Per KDB 865664 D01, Dipole SAR Validation Verification, BALUN LAB has adopted 3 years calibration intervals. On annual basis, every measurement dipole has been evaluated and is in compliance with the following criteria:

1. There is no physical damage on the dipole;
2. System validation with specific dipole is within 10% of calibrated value;
3. Return-loss in within 20% of calibrated measurement.

ANNEX A SIMULATING LIQUID VERIFICATION RESULT

The dielectric parameters of the liquids were verified prior to the SAR evaluation using an SCLMP Dielectric Probe Kit.

Date	Liquid Type	Fre. (MHz)	Temp. (℃)	Meas. Conductivity (σ) (S/m)	Meas. Permittivity (ε)	Target Conductivity (σ) (S/m)	Target Permittivity (ε)	Conductivity Tolerance (%)	Permittivity Tolerance (%)
2018.03.22	Body	2450	21.2	1.91	50.53	1.95	52.70	-2.05	-4.12
2018.03.23	Body	5250	21.5	5.42	48.02	5.36	48.95	1.12	-1.90
2018.03.27	Body	5750	21.6	6.10	47.26	5.94	48.27	2.69	-2.09
Note: The tolerance limit of Conductivity and Permittivity is± 5%.									

ANNEX B SYSTEM CHECK RESULT

Comparing to the original SAR value provided by SPEAG, the validation data should be within itsspecification of 10 %(for 1 g).

Date	Liquid Type	Freq. (MHz)	Power (mW)	Measured SAR (W/kg)	Normalized SAR (W/kg)	Dipole SAR (W/kg)	Tolerance (%)	Targeted SAR(W/kg)	Tolerance (%)
2018.03.22	Body	2450	100	5.23	52.30	50.50	3.56	52.40	-0.19
2018.03.23	Body	5250	100	8.01	80.10	75.20	6.52	76.50	4.71
2018.03.27	Body	5750	100	8.02	80.20	75.00	6.93	78.00	2.82
Note: The tolerance limit of System validation ±10%.									

Comparing to the original SAR value provided by SPEAG, the validation data should be within itsspecification of 10 %(for 10 g).

Date	Liquid Type	Freq. (MHz)	Power (mW)	Measured SAR (W/kg)	Normalized SAR (W/kg)	Dipole SAR (W/kg)	Tolerance (%)	Targeted SAR(W/kg)	Tolerance (%)
2018.03.22	Body	2450	100	2.43	24.30	23.30	4.29	24.00	1.25
2018.03.23	Body	5250	100	2.20	22.00	21.20	3.77	21.60	1.85
2018.03.27	Body	5750	100	2.13	21.30	21.10	0.95	21.90	-2.74
Note: The tolerance limit of System validation ±10%.									

System Performance Check Data (2450MHz Body)

Date: 2018.03.22
Communication System Band: D2450 (2450.0 MHz); Frequency: 2450 MHz;Duty Cycle: 1:1
Medium parameters used: f = 2450 MHz; σ = 1.91 S/m; ε_r = 50.53; ρ = 1000 kg/m^3
Phantom section: Flat Section

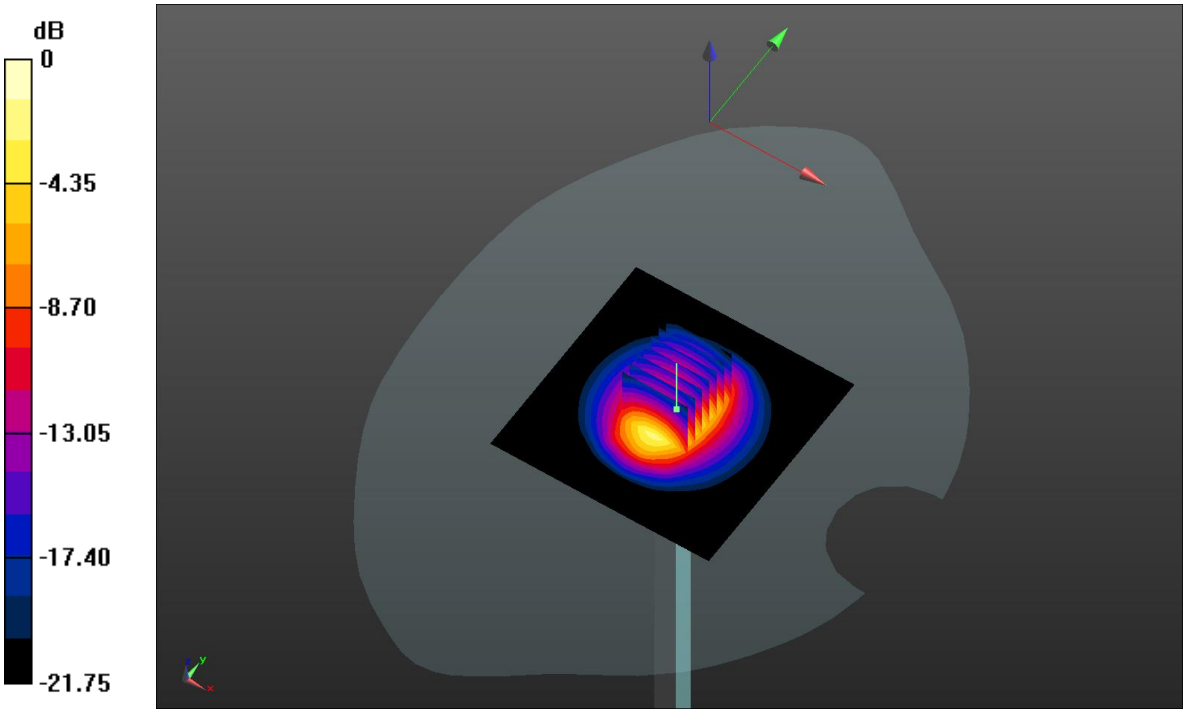
Ambient Temperature:22.6 Liquid Temperature:21.2

DASY5 Configuration:

- Probe: ES3DV3 – SN3110; ConvF(4.23, 4.23, 4.23); Calibrated: 2017.08.02;
- Sensor-Surface: 4mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn685; Calibrated: 2017.08.02
- Phantom: SAM (30deg probe tilt) with CRP v5.0 on left 1859; Type: QD000P40CD; Serial: TP:1859
- Measurement SW: DASY52, Version 52.8 (8); SEMCAD X Version 14.6.10 (7331)

CW2450 100mW/Area Scan (101x101x1): Interpolated grid: dx=10mm, dy=10mm
Maximum value of SAR (interpolated) = 6.09 W/kg

CW2450 100mW/Zoom Scan (7x7x7)/Cube 0: Measurement grid: dx=5mm, dy=5mm, dz=5mm
Reference Value = 54.90 V/m; Power Drift = 0.01 dB
Peak SAR (extrapolated) = 10.5 W/kg
SAR(1 g) = 5.23 W/kg; SAR(10 g) = 2.43 W/kg
Maximum value of SAR (measured) = 6.05 W/kg



0 dB = 6.05 W/kg

System Performance Check Data (5250MHz Body)

Date: 2018.03.23
Communication System Band: D5GHz (5000.0 - 6000.0 MHz); Frequency: 5250 MHz;Duty Cycle: 1:1
Medium parameters used: f = 5250 MHz; σ = 5.42 S/m; ε_r = 48.02; ρ = 1000 kg/m^3
Phantom section: Flat Section

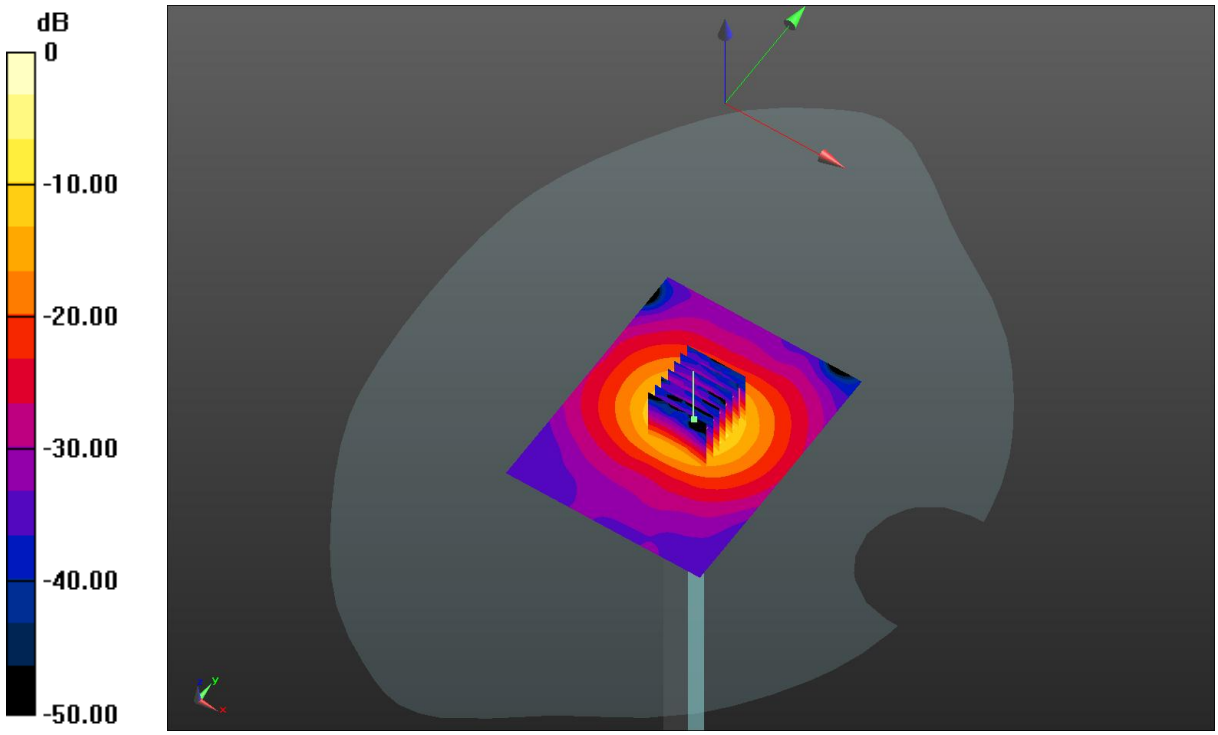
Ambient Temperature:22.7 Liquid Temperature:21.5

DASY5 Configuration:

- Probe: EX3DV4 - SN7340; ConvF(5.16, 5.16, 5.16); Calibrated: 2018.01.11;
- Sensor-Surface: 2mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn685; Calibrated: 2017.08.02
- Phantom: SAM (30deg probe tilt) with CRP v5.0 Right 1857; Type: QD000P40CD; Serial: TP1857
- Measurement SW: DASY52, Version 52.8 (8); SEMCAD X Version 14.6.10 (7331)

CW5250 100mW/Area Scan (81x101x1): Interpolated grid: dx=10mm, dy=10mm
Maximum value of SAR (interpolated) = 9.50 W/kg

CW5250 100mW/Zoom Scan (7x7x15)/Cube 0: Measurement grid: dx=4mm, dy=4mm, dz=2mm
Reference Value = 38.45 V/m; Power Drift = -0.04 dB
Peak SAR (extrapolated) = 34.3 W/kg
SAR(1 g) = 8.01 W/kg; SAR(10 g) = 2.2 W/kg
Maximum value of SAR (measured) = 16.8 W/kg



0 dB = 16.8 W/kg

System Performance Check Data (5750MHz Body)

Date: 2018.03.27
Communication System Band: D5GHz (5000.0 - 6000.0 MHz); Frequency: 5750 MHz;Duty Cycle: 1:1
Medium parameters used: f = 5750 MHz; σ = 6.1 S/m; ε_r = 47.26; ρ = 1000 kg/m^3
Phantom section: Flat Section

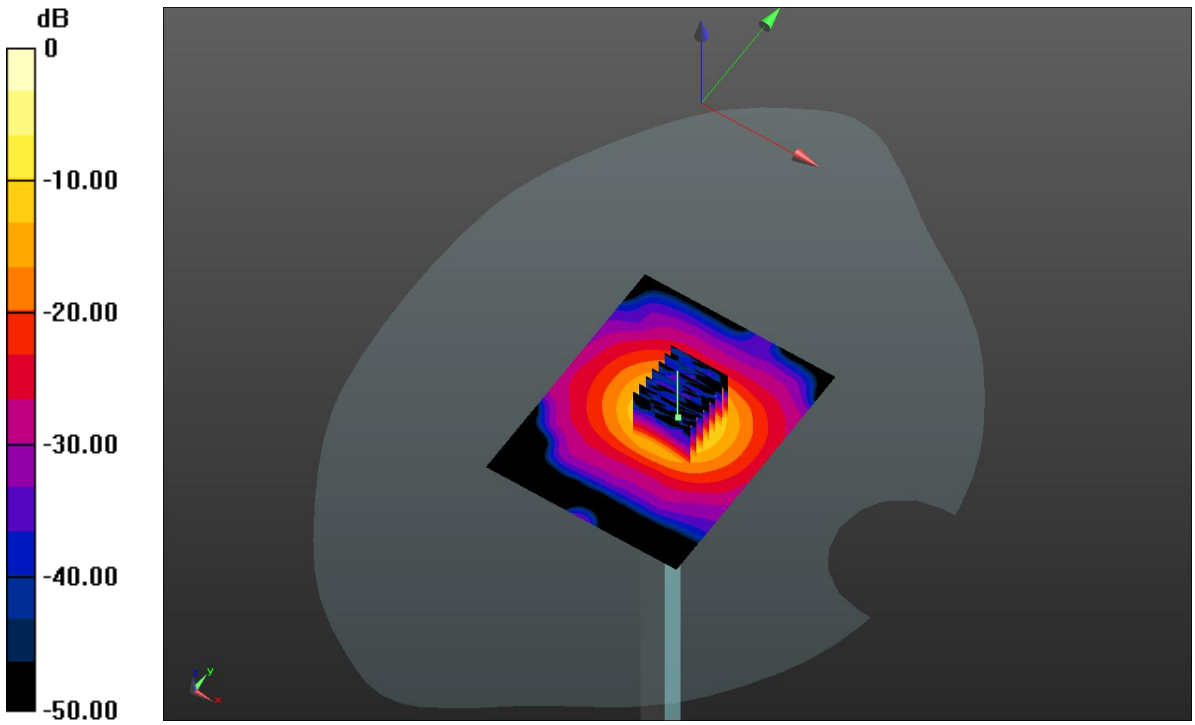
Ambient Temperature:22.8 Liquid Temperature:21.6

DASY5 Configuration:

- Probe: EX3DV4 - SN7340; ConvF(4.58, 4.58, 4.58); Calibrated: 2018.01.11;
- Sensor-Surface: 2mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn685; Calibrated: 2017.08.02
- Phantom: SAM (30deg probe tilt) with CRP v5.0 Right 1857; Type: QD000P40CD; Serial: TP1857
- Measurement SW: DASY52, Version 52.8 (8); SEMCAD X Version 14.6.10 (7331)

CW5750 100mW/Area Scan (81x101x1): Interpolated grid: dx=10mm, dy=10mm
Maximum value of SAR (interpolated) = 9.02 W/kg

CW5750 100mW/Zoom Scan (7x7x21)/Cube 0: Measurement grid: dx=4mm, dy=4mm, dz=2mm
Reference Value = 33.32 V/m; Power Drift = -0.02 dB
Peak SAR (extrapolated) = 40.4 W/kg
SAR(1 g) = 8.02 W/kg; SAR(10 g) = 2.13 W/kg
Maximum value of SAR (measured) = 17.1 W/kg



0 dB = 17.1 W/kg

ANNEX C TEST DATA

1_Body Plan with Ant 180° Back 10 mm on High Channel in 802.15.4 mode
Date: 2018.03.22
Communication System Band: Zigbee; Frequency: 2475 MHz;Duty Cycle: 1:5.277
Medium parameters used (interpolated): f = 2475 MHz; σ = 1.94 S/m; ε_r = 50.42; ρ = 1000 kg/m^3
Phantom section: Flat Section

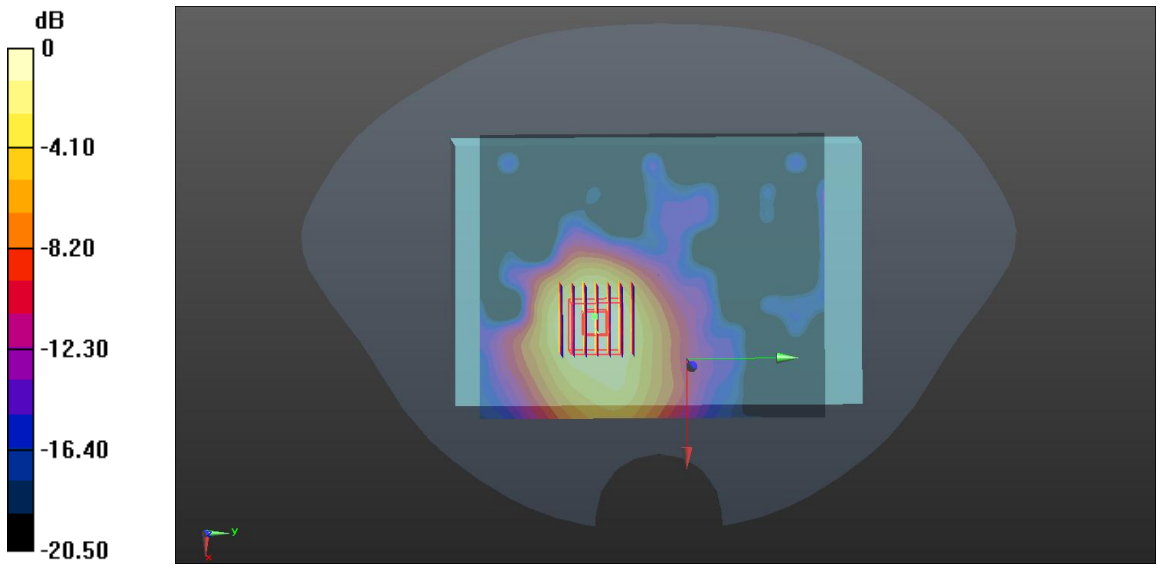
Ambient Temperature:22.6 Liquid Temperature:21.2

DASY5 Configuration:

- Probe: ES3DV3 - SN3110; ConvF(4.23, 4.23, 4.23); Calibrated: 2017.08.02;
- Sensor-Surface: 4mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn685; Calibrated: 2017.08.02
- Phantom: SAM (30deg probe tilt) with CRP v5.0 on left 1859; Type: QD000P40CD; Serial: TP:1859
- Measurement SW: DASY52, Version 52.8 (8); SEMCAD X Version 14.6.10 (7331)

Ch25/Area Scan (101x121x1): Interpolated grid: dx=1.200 mm, dy=1.200 mm
Maximum value of SAR (interpolated) = 0.0580 W/kg

Ch25/Zoom Scan (7x7x7)/Cube 0: Measurement grid: dx=5mm, dy=5mm, dz=5mm
Reference Value = 1.392 V/m; Power Drift = 0.12 dB
Peak SAR (extrapolated) = 0.0960 W/kg
SAR(1 g) = 0.053 W/kg; SAR(10 g) = 0.028 W/kg
Maximum value of SAR (measured) = 0.0576 W/kg



0 dB = 0.0576 W/kg

2_Body Plan with Ant 180° Back 0 mm on High Channel in 802.15.4 mode

Date: 2018.03.22

Communication System Band: Zigbee; Frequency: 2475 MHz;Duty Cycle: 1:5.277

Medium parameters used (interpolated): f = 2475 MHz; σ = 1.94 S/m; ε_r = 50.42; ρ = 1000 kg/m^3

Phantom section: Flat Section

Ambient Temperature:22.6 Liquid Temperature:21.2

DASY5 Configuration:

- Probe: ES3DV3 - SN3110; ConvF(4.23, 4.23, 4.23); Calibrated: 2017.08.02;
- Sensor-Surface: 4mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn685; Calibrated: 2017.08.02
- Phantom: SAM (30deg probe tilt) with CRP v5.0 on left 1859; Type: QD000P40CD; Serial: TP:1859
- Measurement SW: DASY52, Version 52.8 (8); SEMCAD X Version 14.6.10 (7331)

Ch25/Area Scan (101x121x1): Interpolated grid: dx=1.200 mm, dy=1.200 mm

Maximum value of SAR (interpolated) = 0.266 W/kg

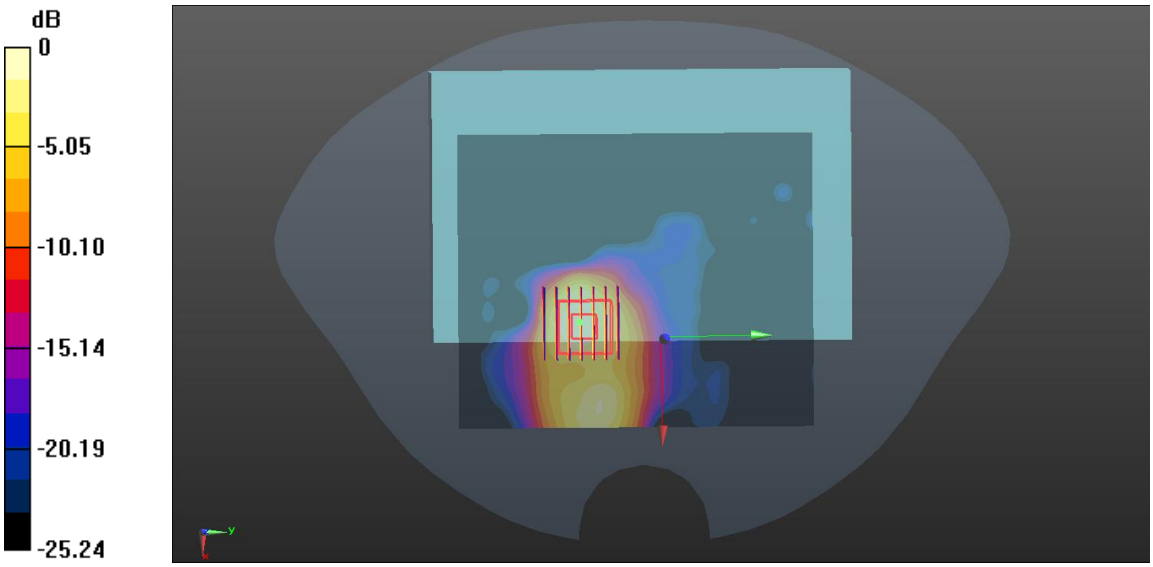
Ch25/Zoom Scan (7x7x7)/Cube 0: Measurement grid: dx=5mm, dy=5mm, dz=5mm

Reference Value = 0.7850 V/m; Power Drift = 0.06 dB

Peak SAR (extrapolated) = 0.422 W/kg

SAR(1 g) = 0.229 W/kg; SAR(10 g) = 0.102 W/kg

Maximum value of SAR (measured) = 0.256 W/kg



0 dB = 0.256 W/kg

3_Body Plan with Ant Mode2 Tip 10 mm on Channel 48 in 802.11a mode

Date: 2018.03.23

Communication System Band: WLAN(a); Frequency: 5240 MHz;Duty Cycle: 1:1.059

Medium parameters used (interpolated): f = 5240 MHz; σ = 5.37 S/m; ε_r = 48.73; ρ = 1000 kg/m^3

Phantom section: Flat Section

Ambient Temperature:22.7 Liquid Temperature:21.5

DASY5 Configuration:

- Probe: ES3DV4 - SN7340; ConvF(5.16, 5.16, 5.16); Calibrated: 2018.01.11;
- Sensor-Surface: 2mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn685; Calibrated: 2017.08.02
- Phantom: SAM (30deg probe tilt) with CRP v5.0 Right 1857; Type: QD000P40CD; Serial: TP1857
- Measurement SW: DASY52, Version 52.8 (8); SEMCAD X Version 14.6.10 (7331)

Ch48/Area Scan (121x121x1): Interpolated grid: dx=1.000 mm, dy=1.000 mm

Maximum value of SAR (interpolated) = 1.73 W/kg

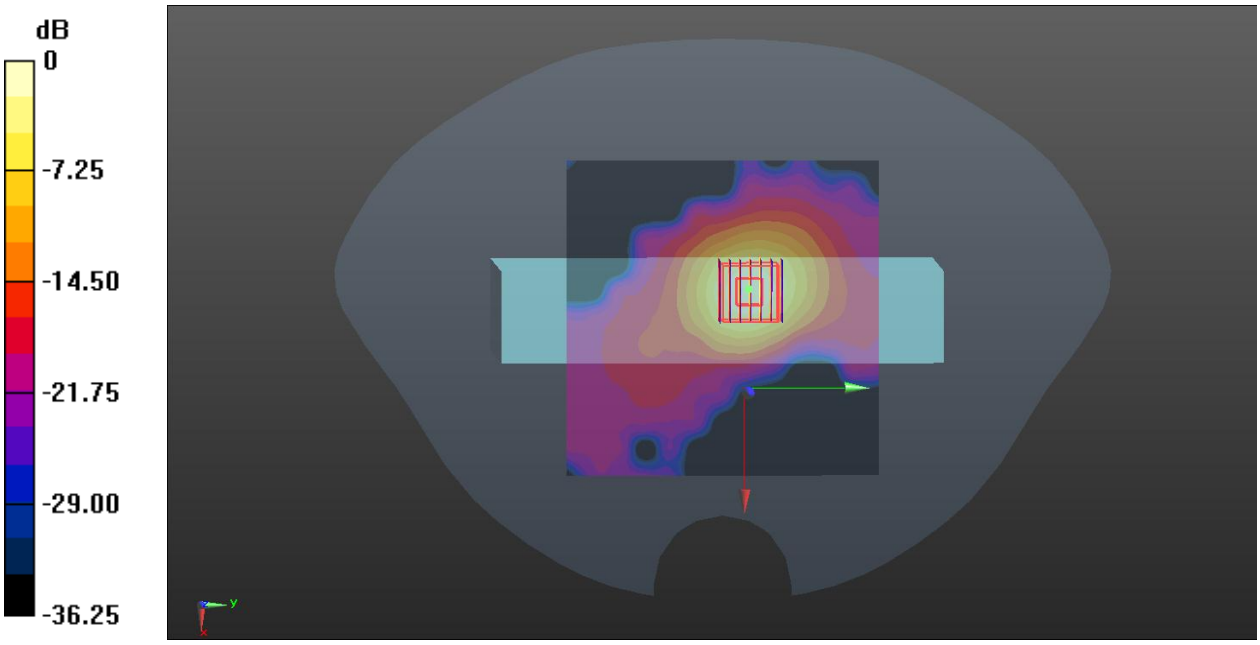
Ch48/Zoom Scan (7x7x13)/Cube 0: Measurement grid: dx=4mm, dy=4mm, dz=2mm

Reference Value = 8.797 V/m; Power Drift = 0.11 dB

Peak SAR (extrapolated) = 4.11 W/kg

SAR(1 g) = 0.887 W/kg; SAR(10 g) = 0.296 W/kg

Maximum value of SAR (measured) = 1.61 W/kg



0 dB = 0.891 W/kg

4_Body Plan with Ant Mode2 Tip 10 mm on Channel 165 in 802.11a mode

Date: 2018.03.27

Communication System Band: WLAN(a); Frequency: 5825 MHz;Duty Cycle: 1:1.059

Medium parameters used (interpolated): f = 5825 MHz; σ = 6.09 S/m; ε_r = 47.11; ρ = 1000 kg/m^3

Phantom section: Flat Section

Ambient Temperature:22.8 Liquid Temperature:21.6

DASY5 Configuration:

- Probe: ES3DV4 - SN7340; ConvF(4.58, 4.58, 4.58); Calibrated: 2018.01.11;
- Sensor-Surface: 2mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn685; Calibrated: 2017.08.02
- Phantom: SAM (30deg probe tilt) with CRP v5.0 Right 1857; Type: QD000P40CD; Serial: TP1857
- Measurement SW: DASY52, Version 52.8 (8); SEMCAD X Version 14.6.10 (7331)

Ch25/Area Scan (121x121x1): Interpolated grid: dx=1.000 mm, dy=1.000 mm

Maximum value of SAR (interpolated) = 1.76 W/kg

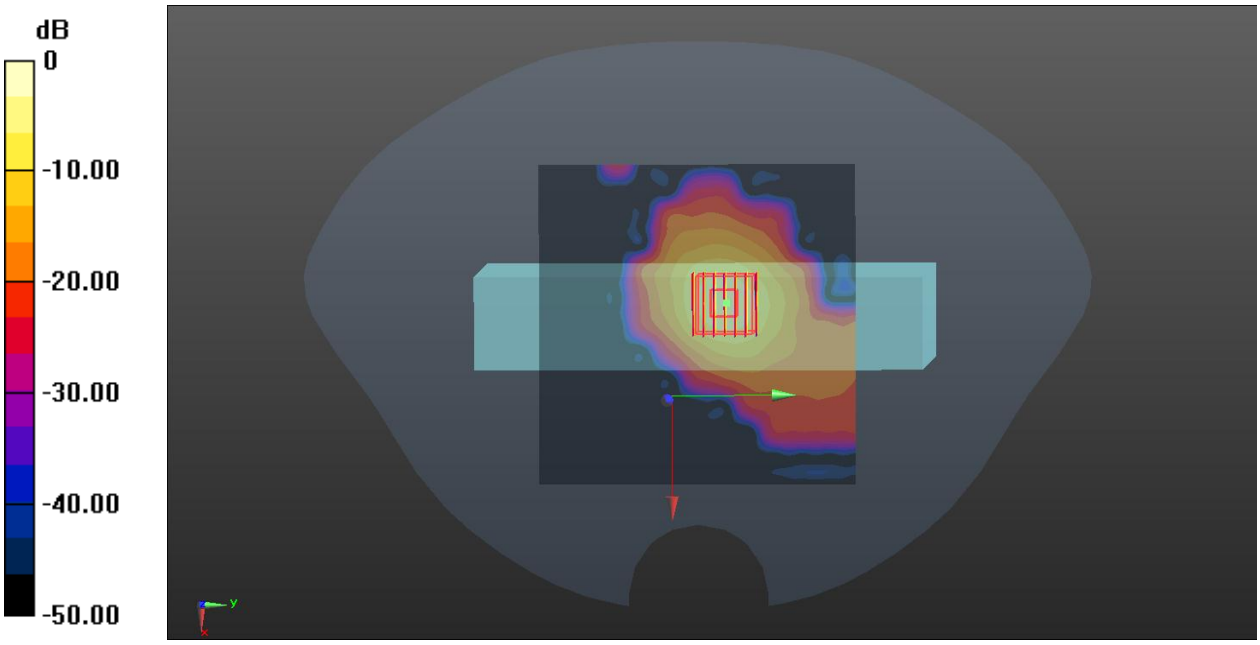
Ch25/Zoom Scan (7x7x13)/Cube 0: Measurement grid: dx=4mm, dy=4mm, dz=2mm

Reference Value = 7.078 V/m; Power Drift = 0.05 dB

Peak SAR (extrapolated) = 4.87 W/kg

SAR(1 g) = 0.979 W/kg; SAR(10 g) = 0.328 W/kg

Maximum value of SAR (measured) = 1.85 W/kg



0 dB = 0.982W/kg

5_Body Plan with Ant Mode3 Front 0 mm on Channel 48 in 802.11a mode

Date: 2018.03.23

Communication System Band: WLAN(a); Frequency: 5240 MHz;Duty Cycle: 1:1.059

Medium parameters used (interpolated): f = 5240 MHz; σ = 5.37 S/m; ε_r = 48.73; ρ = 1000 kg/m^3

Phantom section: Flat Section

Ambient Temperature:22.7 Liquid Temperature:21.5

DASY5 Configuration:

- Probe: ES3DV4 - SN7340; ConvF(5.16, 5.16, 5.16); Calibrated: 2017.01.11;
- Sensor-Surface: 2mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn685; Calibrated: 2017.08.02
- Phantom: SAM (30deg probe tilt) with CRP v5.0 Right 1857; Type: QD000P40CD; Serial: TP1857
- Measurement SW: DASY52, Version 52.8 (8); SEMCAD X Version 14.6.10 (7331)

Ch48/Area Scan (121x121x1): Interpolated grid: dx=1.000 mm, dy=1.000 mm

Maximum value of SAR (interpolated) = 0.213 W/kg

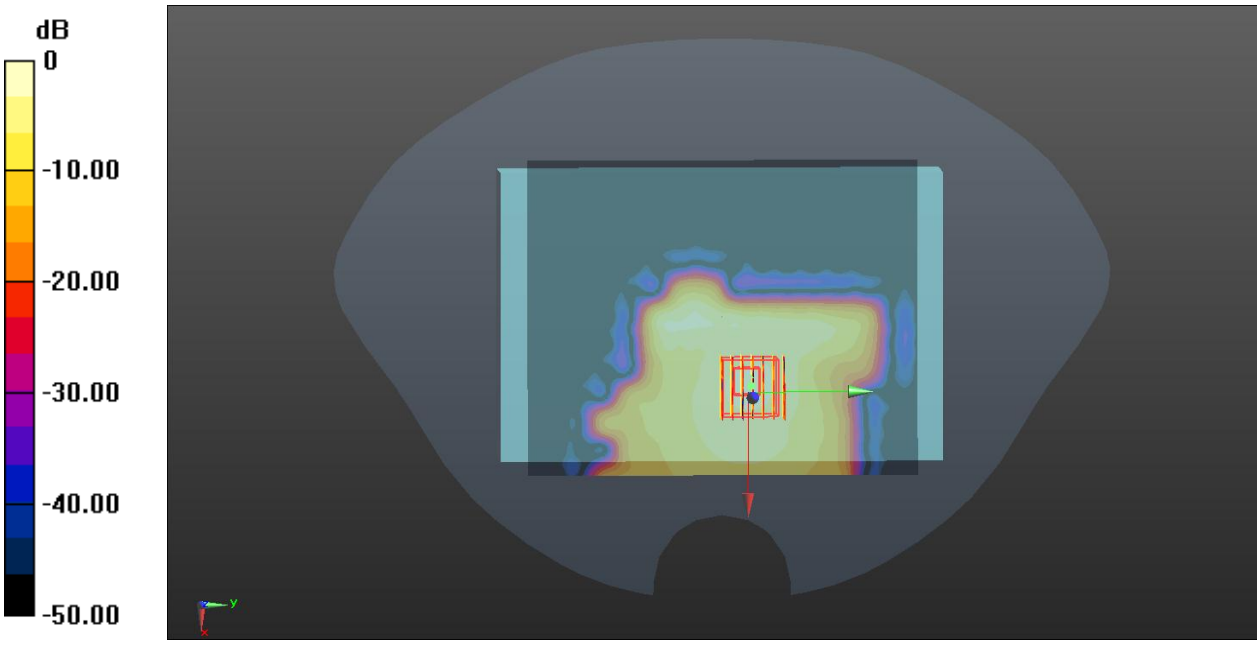
Ch48/Zoom Scan (7x7x13)/Cube 0: Measurement grid: dx=4mm, dy=4mm, dz=2mm

Reference Value = 4.594 V/m; Power Drift = -0.19 dB

Peak SAR (extrapolated) = 0.587 W/kg

SAR(1 g) = 0.129 W/kg; SAR(10 g) = 0.052 W/kg

Maximum value of SAR (measured) = 0.224 W/kg



0 dB = 0.161W/kg

6_Body Plan with Ant Mode3 Front 0 mm on Channel 165 in 802.11a mode

Date: 2018.03.27

Communication System Band: WLAN(a); Frequency: 5825 MHz;Duty Cycle: 1:1.059

Medium parameters used (interpolated): f = 5825 MHz; σ = 6.09 S/m; ε_r = 47.11; ρ = 1000 kg/m^3

Phantom section: Flat Section

Ambient Temperature:22.8 Liquid Temperature:21.6

DASY5 Configuration:

- Probe: ES3DV4 - SN7340; ConvF(4.58, 4.58, 4.58); Calibrated: 2017.01.11;
- Sensor-Surface: 2mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn685; Calibrated: 2017.08.02
- Phantom: SAM (30deg probe tilt) with CRP v5.0 Right 1857; Type: QD000P40CD; Serial: TP1857
- Measurement SW: DASY52, Version 52.8 (8); SEMCAD X Version 14.6.10 (7331)

Ch165/Area Scan (121x121x1): Interpolated grid: dx=1.000 mm, dy=1.000 mm

Maximum value of SAR (interpolated) = 0.298 W/kg

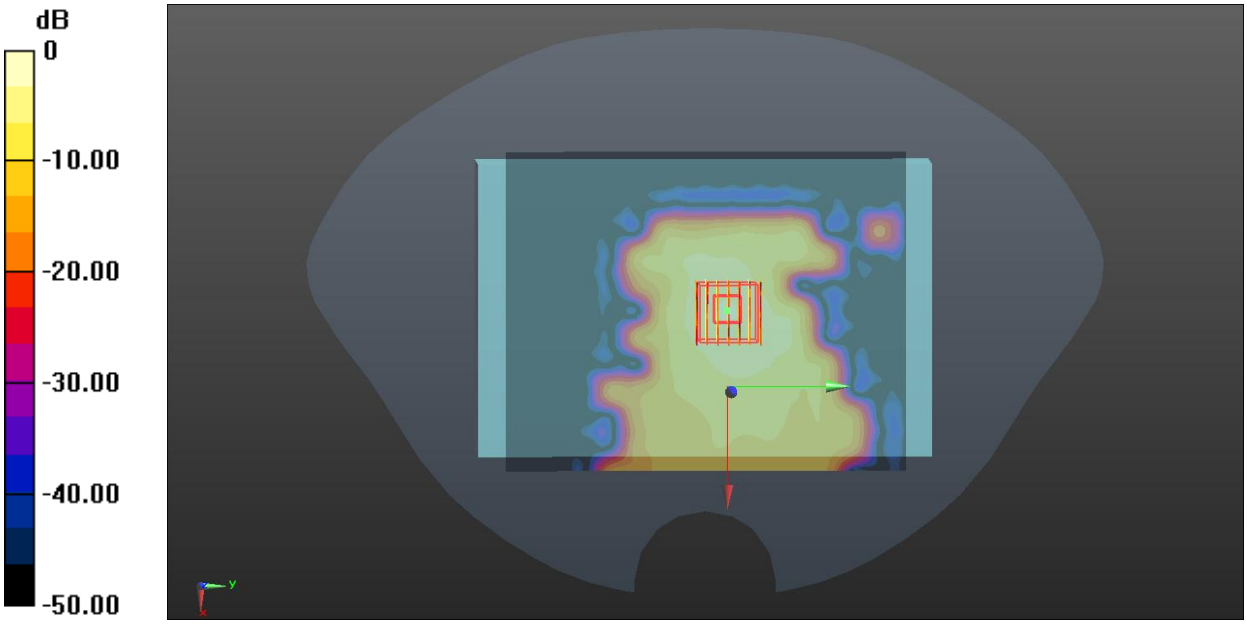
Ch165/Zoom Scan (7x7x13)/Cube 0: Measurement grid: dx=4mm, dy=4mm, dz=2mm

Reference Value = 3.197 V/m; Power Drift = -0.10 dB

Peak SAR (extrapolated) = 0.903 W/kg

SAR(1 g) = 0.192 W/kg; SAR(10 g) = 0.076 W/kg

Maximum value of SAR (measured) = 0.346 W/kg



0 dB = 0.195 W/kg

ANNEX D EUT EXTERNAL PHOTOS

Please refer the document “BL-EC1810138-AW.pdf”.

ANNEX E SAR TEST SETUP PHOTOS

Please refer the document “BL-EC1810138-AS.pdf”.

ANNEX F CALIBRATION REPORT

Please refer the document “CALIBRATION REPORT.pdf”.

--END OF REPORT--